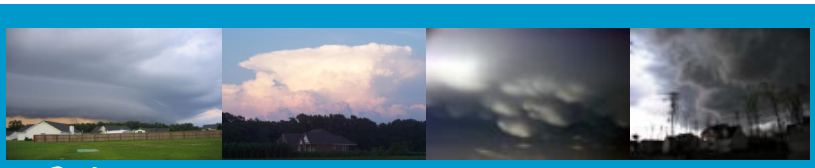

Changing Skies
Over Central North Carolina

VOLUME II, ISSUE I SPRING 2014
NOAA'S NATIONAL WEATHER SERVICE RALEIGH, NC

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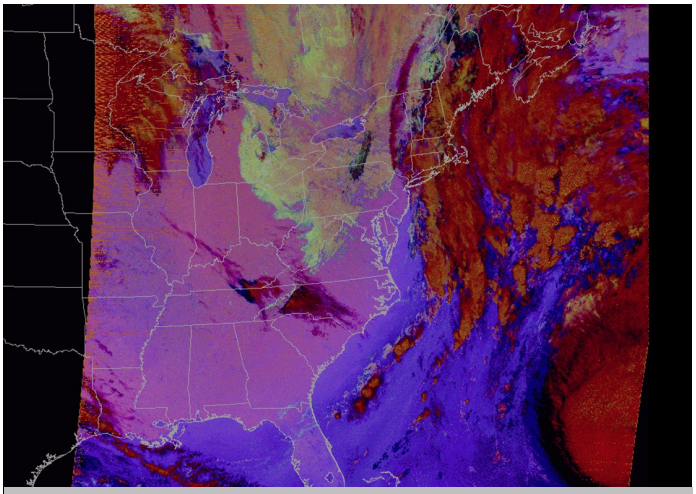
NWS Raleigh Evaluates New NASA Products



NASA Nighttime Microphysics Red Green Blue Product

One of the perks of working at the National Weather Service is that forecasters are on the forefront of new technology development in the field. Under current development are new satellite products captured using MODIS (Moderate Resolution Imaging Spectroradiometer), an instrument on NASA's Aqua and Terra polar orbiting satellites. While polar orbiters are nothing new, some of the new measuring techniques and the images they produce are. Forecasters at the NWS in Raleigh have teamed up with scientists involved in NASA's SPoRT (Short-term Prediction Research and Transition Center) largely based in Huntsville, AL. Below is an overview of the program along with some of the products now becoming available to forecasters.

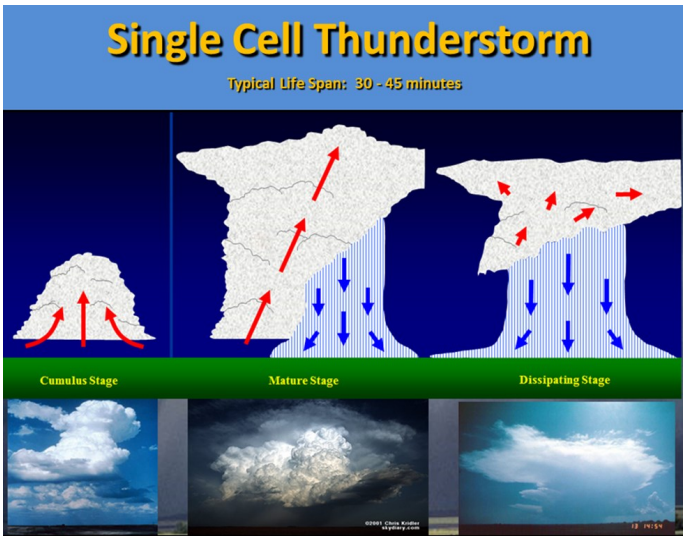
MODIS is a key instrument aboard both the Terra and Aqua NASA EOS satellites. Terra's orbit crosses the equator at 10:30 am and pm, while Aqua's passes are at 1:30 am and pm, together providing up to 4 passes per day, with global coverage every 1-2 days. The MODIS instrument acquires data in 36 spectral bands at resolutions of 1 km, 500 m, and 250 m, allowing for the retrieval of atmospheric, surface, and cloud properties at high resolutions. Real-time MODIS imagery is available from a number of direct broadcast ground stations throughout the world. SPoRT obtains this imagery from the University of Wisconsin (UW) and the University of South Florida (USF) direct broadcast stations and provides selected products to NWS Forecast Offices formatted for display in their native AWIPS system.

Specifically, SPoRT uses single bands from the visible and infrared to provide high resolution imagery to its NWS partner offices and multiple bands to generate products such as color composite imagery, land surface temperature, and a cloud mask. In addition to in-house generated products, several MODIS products including cloud top pressure, lifted index and cloud phase are obtained from the University of Wisconsin and distributed to NWS offices. A sea surface temperature product is obtained from the University of South Florida and is used to generate a SPoRT Sea Surface Temperature composite.

One of many products the Raleigh forecast office is the MODIS "Nighttime Microphysics" or "Fog" RGB products. The product uses a total of three infrared channels to identify low clouds and fog, low stratus, and thin cirrus. Red shades are related to the difference in bands 32 and 31 (11.7 and 10.7 μm), green shades relate to the difference in bands 31 and 29 (11.7 and 8.4 μm), and the blue shades relate to the brightness temperature in band 31. The RGB composite recipe was developed by the European Organization for the Exploitation of Meteorological Satellites to provide a cloud analysis, detection of fog, contrails, and snow. The composite is designed to characterize fog with a light green color. The actual shade of the fog color will depend upon the depth of the fog layer and the temperature contrast between the cloud top and the underlying surface. As the surface temperature warms, the color of fog in the composite will transition from a light green to a light blue, due to the inclusion of the infrared channel assigned to the blue color. Deep convective clouds appear in deep reds. High level ice clouds, such as cirrus, appear in dark shades of blue.

-Ryan Ellis

Know Your Thunderstorm Types!



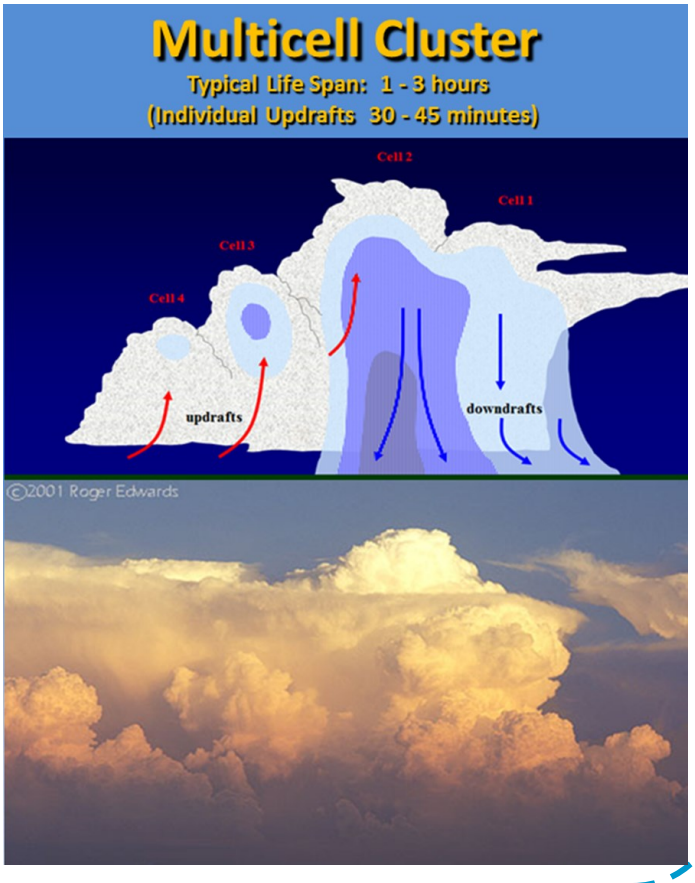
Ordinary/Single cell storms, with short life spans of typically only 30-45 minutes, are the least organized and occur in environments characterized by weak vertical wind shear, often-times during the heat and humidity of summer when winds aloft are weak. Heavy rain, gusty (sometimes severe) downburst wind, and small hail often result from single cell storms. They pose the lowest risk of severe weather.

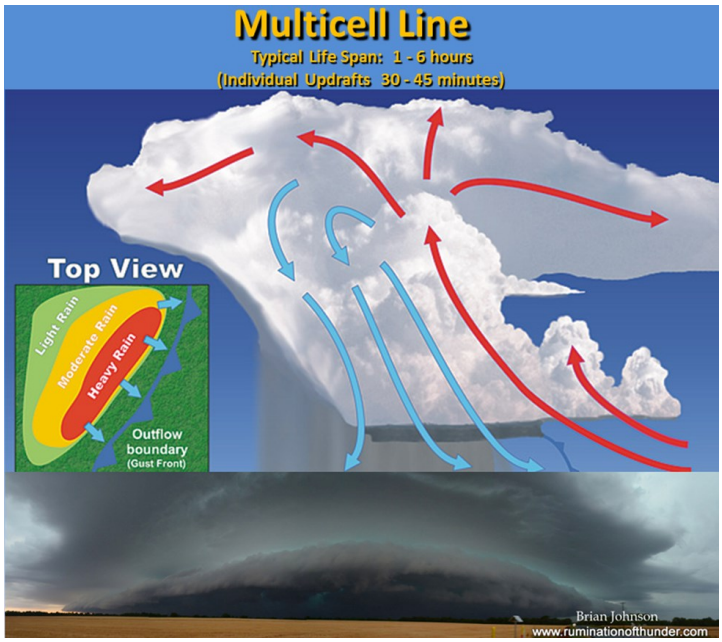
Thunderstorm intensity and which weather hazards the storms produce are related to the type, or organization, of the thunderstorm. Thunderstorm type is largely dictated by the magnitude of the vertical wind shear, or the change in wind speed and/or direction with height. Stronger wind shear typically results in a higher degree of storm organization and consequent risk of severe weather. There are three general thunderstorm types within the thunderstorm spectrum: ordinary/single cell, multicellular, and supercell. A "cell" represents one updraft/downdraft couplet.

The Thunderstorm Spectrum

Single Cell	Multicell Cluster	Multicell Line	Supercell
Updraft Strength: Weak: Non-Severe Strong: Maybe Severe	Updraft Strength: Weak: Non-Severe Strong: Severe	Updraft Strength: Weak: Non-Severe Strong: Severe	Updraft Strength: Intense Mesocyclone Almost Always Severe
SLIGHT THREAT	MODERATE THREAT	MODERATE THREAT	HIGH THREAT

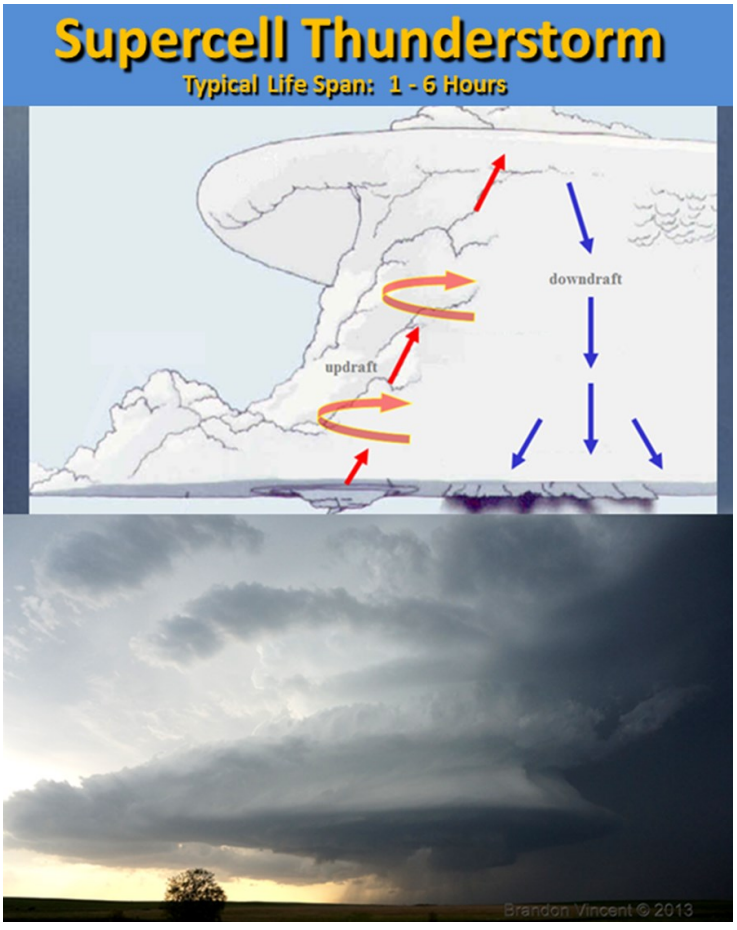
Multicellular storms, whether in the form of a small, loosely-organized cluster or an extensive and well-organized line, form where vertical wind shear is stronger. This





storm type, as the name suggests, consists of multiple cells - usually in different stages of their respective life cycles – and all share a common rain-cooled (outflow) boundary. Though the individual cells have similar duration life cycles as single cell storms, the cluster or line of individual cells can persist for several hours, sometimes covering very large distances during the course of an entire day, as new cells continually develop along the outflow boundary. Multicells pose a greater risk of severe weather, primarily in the form of damaging straight-line wind gusts and weak tornadoes.

Supercell storms, which also can persist for many hours and travel large distances, are characterized by a rotating updraft called a mesocyclone. Supercells are highly-organized storms that develop in strongly-sheared environments, and almost all produce some type of severe weather, ranging from very large hail, extreme straight-line wind gusts, to (sometimes violent) tornadoes.

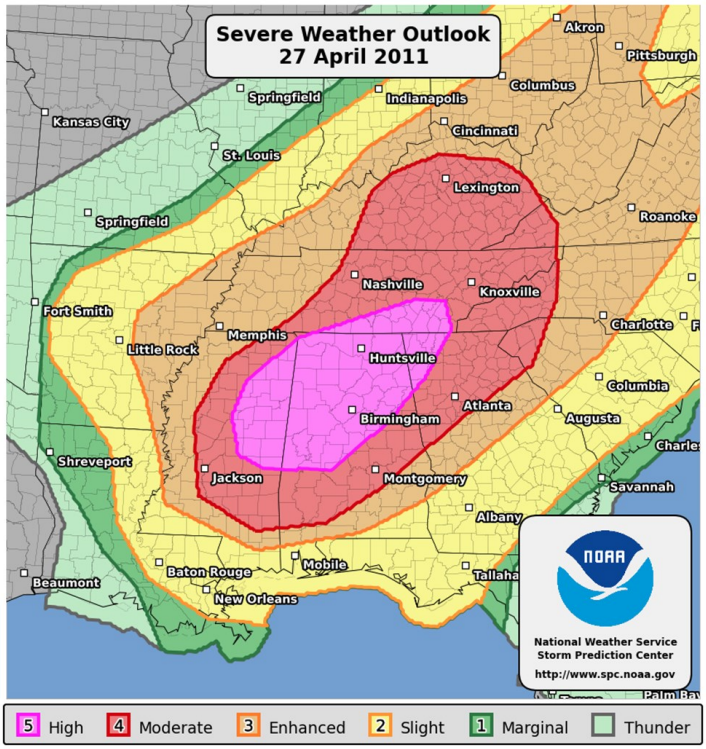


Though vertical wind shear is not the only factor in determining storm type, the correlation is high. The next time there is severe weather mentioned in the forecast, think about the hazards mentioned and what storm type might be the most likely to produce them. Then check out the radar to see if you were right!

-Michael Strickler

(Photo Credits: Chris Kridler, Brian Johnson Roger Edwards and Brandon Vincent)

Storm Prediction Center Planning to Change Outlook Categories



Storm Prediction Center Proposed Outlook Changes Illustrated by April 27, 2011 Severe Weather Outlook

Q: How are the outlooks changing for Day 1, Day 2 and Day 3?

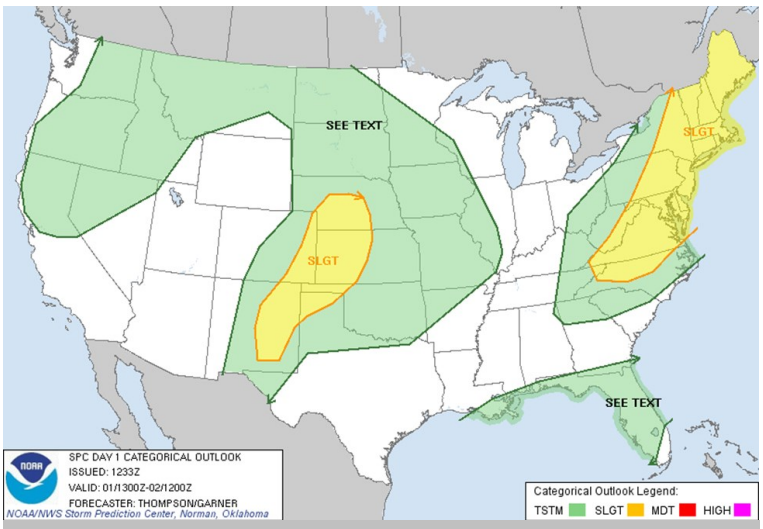
A: The SPC plans to revise Day 1 through Day 3 categorical severe weather outlooks to better communicate risk and describe the likelihood of severe weather. Format changes will also improve the use of SPC severe weather forecasts for customers who incorporate SPC outlooks into GIS systems. The SPC plans to expand the risk categories from four to five and clarify the risk previously labeled as "See Text." That descriptor would be replaced by a categorical line and the term "Marginal" to denote areas with a 5 percent probability of severe weather. The upper end of the "Slight Risk" category will be renamed "Enhanced" (short for "Enhanced Slight") to denote a threshold 30 percent probability of severe wind or hail and/or a 10 percent chance of a tornado during the Day 1 period. For Days 2 and 3, the "Enhanced" risk category will denote a 30 percent total severe probability. The Moderate and High risk thresholds will remain essentially unchanged.

Q: Why is the SPC proposing to do this?

A: A primary goal of these changes is to bring better consistency to the risks communicated in SPC outlooks, from the short-range Day 1 outlooks through the extended range Day 4-8 outlooks. The changes are being made based on customer feedback and to better meet their needs.
Example: Currently, a 10 percent tornado probability including a risk of a significant tornado (>=EF2) is categorized as a Slight Risk. This is the same category used for a "low end" 15 percent risk of severe thunderstorm wind and hail events. In the new scheme, a 10 percent tornado probability that includes the chance of significant tornadoes would be categorized as an Enhanced Risk.
In addition, "See Text" does not currently convey a threat area, due to the lack of a contour in any "See Text" categorical forecast. And the current "Slight Risk" category covers too broad a range of severe weather probability values.

Q: Are there cases where the current categories will change based on the underlying severe weather probabilities?

A: The thresholds for traditional risk categories are essentially unchanged but there is some refinement in the underlying definitions to remain consistent with evolving trends in severe weather reporting. These refinements would only impact a couple of Day 1 tornado and severe wind outlooks during any year. A 15 percent tornado probability without a threat of an EF-2 or greater tornado at Day 1 will qualify as an Enhanced Day 1 tornado risk



Current SPC Outlook Format

as opposed to the current scheme where it is a Moderate Day 1 Tornado Risk. Likewise, a 45 percent severe thunderstorm wind probability without a significant threat at Day 1 will qualify as an Enhanced Day 1 wind risk as opposed to the current scheme where it is a Moderate Day 1 wind risk.

Q: Why not a more comprehensive overhaul of all categorical outlook words (i.e. SLGT, MDT, HIGH)?

A: The categorical words Slight, Moderate and High have been used by SPC for nearly 35 years and are generally understood by the weather risk communication community. Making measured changes to the current system, we believe, is more effective than a wholesale change. These measured changes include: 1) moving to de-emphasize the specific words; and 2) working to communicate the level of risk to the public in multiple ways. This includes numerical risk categorization, appropriate colors to indicate severity, and strategic use of icons and symbols. Social scientists have encouraged us to communicate on multiple levels and not just with a single word, label or category.

Q: When will this change occur?

A: A 45-Day Public Comment Period regarding the proposed outlook changes will end on June 17, 2014. After assessing the feedback and incorporating any needed adjustments, a Service Change Notice will be issued at least 75 days prior to the implementation of changes to the outlook categories. Currently, a change is most likely to occur in September 2014.

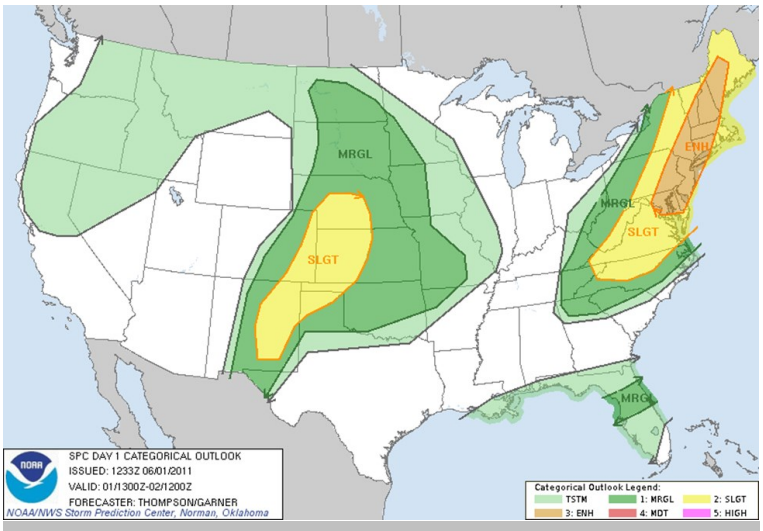
Q: What role did social science play in making this change?

A: The NWS has a strong commitment to engaging the social sciences in evolving our services, and this community has helped inform our decision making for this change.

-SPC

A Product Description Document can be found here.

We are seeking your opinions regarding this change, feedback can be provided here.



Proposed SPC Outlook Format

Current:

1. See Text
2. Slight (SLGT)
3. Moderate (MDT)
4. High (HIGH)

Proposed:

1. Marginal (MRGL) - replaces the current SEE TEXT and now is described with Categorical line on the SPC Outlook.
2. Slight (SLGT)
3. Enhanced (ENH) - will replace upper-end SLGT risk probabilities, but is not a MDT risk
4. Moderate (MDT)
5. High (HIGH)

2014 National Hurricane Center Product Update

The official Atlantic hurricane season begins June 1, and lasts until November 30. Looking back to 2013, there were 13 named storms in the north Atlantic basin, with only two reaching hurricane strength. Based on the thirty-year climatology, the average level of activity is 12 named storms, six hurricanes, and three major hurricanes. For 2013, the number of named storms was near average, but the numbers of hurricanes and major hurricanes were well below average. There were no major hurricanes in the north Atlantic basin for the first time since 1994, and the number of hurricanes was the lowest since 1982.

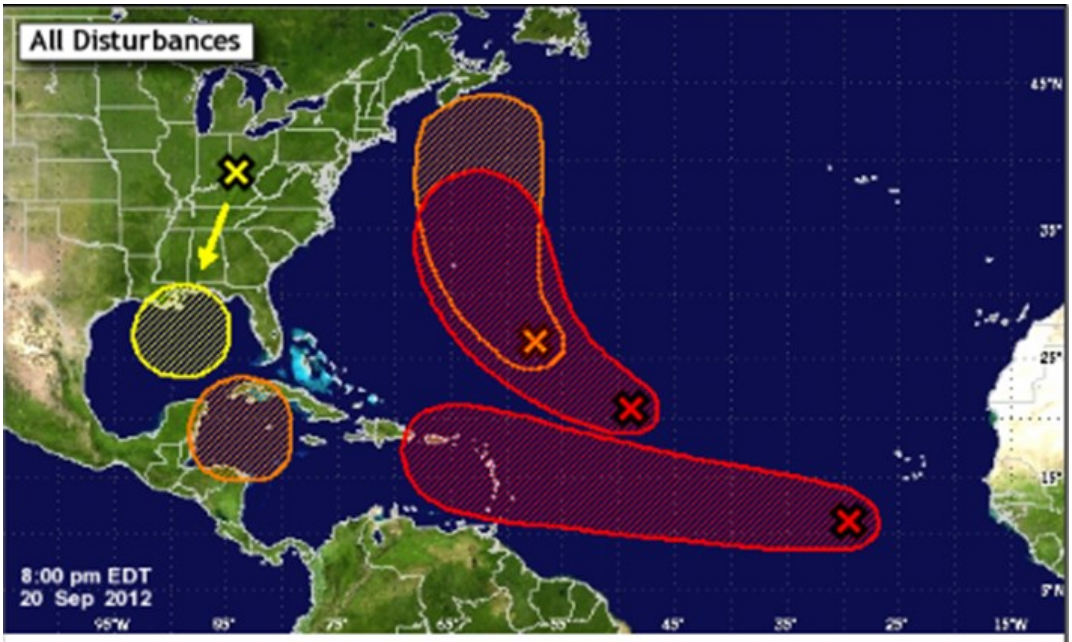
For the upcoming 2014 season, the National Hurricane Center (NHC) plans to implement some changes to certain text and graphical products. Some notable changes are:

Potential Storm Surge Flooding Map

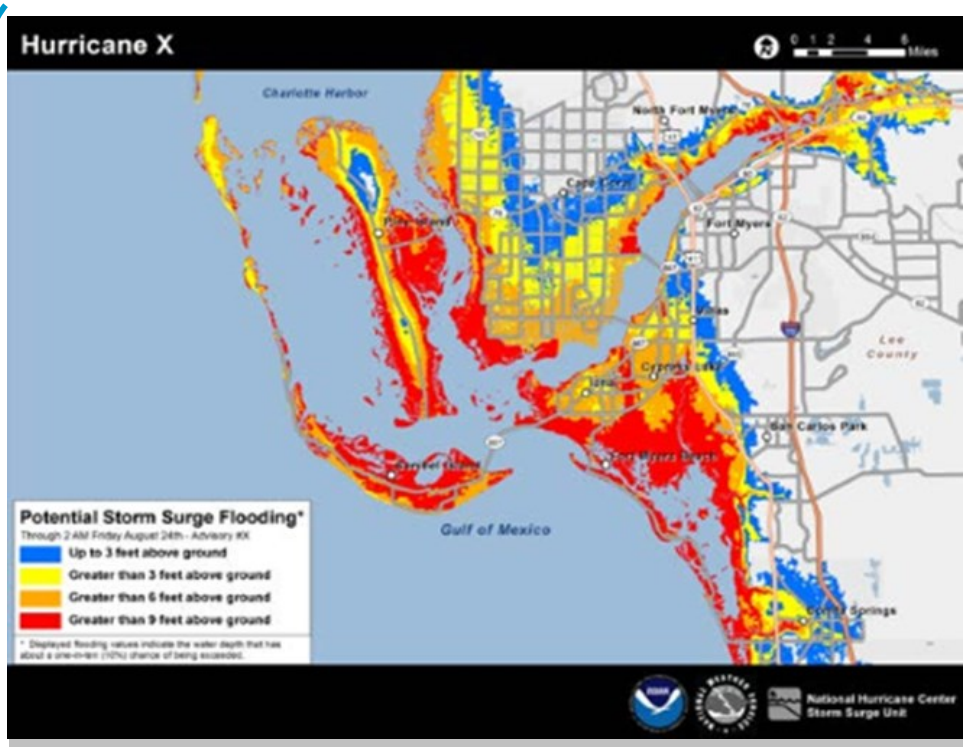
Beginning with the 2014 Atlantic hurricane season, NHC will issue the Potential Storm Surge Flooding Map for those areas along the Gulf and Atlantic coasts of the United States at risk of storm surge from a tropical cyclone. This experimental product provides valuable new information on the storm surge hazard associated with tropical cyclones, by highlighting geographical areas where inundation from storm surge could occur and the height above ground that the water could reach. The map depicts inundation levels that have a 10 percent chance of being exceeded, and can be thought of as representing a reasonable worst-case scenario for any individual location.

Enhancements to the Tropical Weather Outlook and Graphical Tropical Weather Outlook

During the 2013 hurricane season, NHC extended the time period covered in the Tropical Weather Outlook text product (TWO) to 5 days on an experimental basis. This year, the experimental 5-day TWO forecasts become operational, and the form of the TWO will change slightly. In addition, NHC will introduce a corresponding 5-day Graphical Tropical Weather Outlook (GTWO; shown below) to accompany the text product. This new 5-day outlook is scheduled to begin July 1. The TWO and GTWO (after July 1) products are issued at



Tropical Cyclone Formation Potential for the Five-Day Period Ending at 8:00 pm EDT 25 Sep 2012
Chance of Cyclone Formation in 5 Days: Low < 30% Medium 30-50% High > 50%
X indicates current disturbance location; shading indicates potential formation area.



Example of Potential Storm Surge Flooding Map (NHC)

2 am, 8 am, 2 pm, and 8 pm Eastern Daylight Time. During Eastern Standard Time, the outlooks are issued at 1 am, 7 am, 1 pm, and 7 pm.

Use of mixed case in the NHC Tropical Weather Outlook and Tropical Cyclone Discussion

Many National Weather Service alphanumeric products use all capital letters and ellipses ("...") for commas. Beginning in 2014, NHC will issue the Tropical Weather Outlook and the Tropical Cyclone Discussion using mixed case, as well as with the full set of standard punctuation symbols. No formatting changes are planned to the other NHC tropical cyclone advisory products at this time.

Tropical Cyclone Forecast Cone to be Slightly Smaller

The size of the tropical cyclone forecast cone will be slightly smaller in 2014. The cone represents the probable track of the center of a tropical cyclone, and is formed by enclosing the area swept out by a set of imaginary circles places along the forecast track at 12 hours, 24 hours, etc. The size of each circle is set so that two-thirds of historical official forecast errors over the previous five years (2009-2013) fall into the circle. The smaller size of the cone is a result of gradually improving track forecasts.

-Darin Figurskey
Content: NHC

Forecast Period (hours)	Circle radius Atlantic Basin (nautical miles)
12	33
24	52
36	72
48	92
72	125
96	170
120	226

Circle Radii Defining the Size of Forecast Cone (NHC)

NWS Celebrates 20th Anniversary at North Carolina State

To celebrate the 20th anniversary of NWS Raleigh's arrival on the Centennial Campus of North Carolina State University, NWS Raleigh invited Centennial Campus public and private agencies, along with the faculty and staff from the North Carolina State University meteorology program, to an open house on April 11. The event included an introduction and overview of the office, including video commentary from former staff members on historic weather events. A link to the video commentary can be found at https://www.youtube.com/watch?v=KFXOT-85Tb8&feature=youtu.be. Groups were then given a guided tour of the operations area and demonstration of the forecast creation process. The Emergency Coordinator for Central Carolina Skywarn shared information on hazardous weather data collection from amateur radio partners and other Skywarn volunteers, and electronics technicians provided a unique view of the computer systems necessary to support forecast operations.

Working with the Office of Research, Innovation and Economic Development at North Carolina State University, the open house was shared in that office's "Results" magazine, which is published twice annually. A link to the article can be found at research.ncsu.edu/results. Under the title, "All-Weather Partnership: NOAA Forecast Office Informs, Teaches", Gene Pinder, Centennial Campus's Director of Marketing and Communications, wrote about the NWS Raleigh's close relationship with North Carolina State University faculty and students, including the North Carolina State Climate Office, located just two floors below the NWS Raleigh office in Research Building III. The article also featured a few of the NWS Raleigh staff who are graduates of North Carolina State University.

Hydrologist Mike Moneypenny Gives a Tour During Open House

-Darin Figurskey

NWS Raleigh Forecasters Participate in Hazardous Weather Testbed

Hazardous Weather Testbed in Norman, OK

The HWT Experimental Forecast Program (EFP) is focused on the use of computer models of the atmosphere to improve predictions of hazardous and convective weather events from a few hours to a week in advance, and over several counties to the continental U.S. The EFP supports the NWS goal to increase lead-time and accuracy for weather and water warnings and forecasts.

The NOAA HWT EFP Spring Experiment is a yearly project that investigates the use of convection-allowing model forecasts as guidance for the prediction of severe convective weather. A variety of model output is examined and evaluated daily during the project and experimental severe weather forecasts are created and verified. The variety of model output allows us to explore different types of guidance, including products derived from both ensembles and deterministic forecasts.

The 2014 Spring Forecast Experiment will be held from May 5–June 6 in the HWT facility at the National Weather Center in Norman. The Experiment is scheduled to run Monday through Friday from 8 am to 4 pm.

The Experimental Warning Program is a part of the NOAA Hazardous Weather Testbed (HWT) at the National Weather Center (NWC) in Norman, Oklahoma. The HWT EWP mission is to improve the nation's hazardous weather warning services by bringing together forecasters, researchers, trainers, technology specialists, and other stakeholders to test and evaluate new techniques, applications, observing platforms, and technologies.

The annual Spring Experiment provides forecasters with a first-hand look at the latest research concepts and products, and immerses research scientists in the challenges, needs, and constraints of front-line forecasters. The EWP helps transition severe weather research and technology to improve the Weather Forecast Office's severe weather warnings for hail, wind and tornadoes. The EWP tests research concepts and technology specifically aimed at short-fused warnings of severe convective weather. Forecasters from the Raleigh office are slated to participate in both programs and will spend one week per forecaster at the National Weather Center in Norman, Oklahoma.

-Ryan Ellis